

PENG LIU

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<https://www.rocmind.com>

RESEARCH INTERESTS

Healthcare: I am immensely interested in building automatic, robust, and explainable intelligent systems for disease diagnosis and interventions.

Human Brain Cognition: I have a broad interest in understanding the brain, revealing the neural mechanisms underlying both normal brain functions and pathologies in mental disorders, and gaining inspiration to build a better AI with which we can better address healthcare challenges.

Machine Learning, Intelligent Algorithm, and Statistical Modeling: Artificial Neural Network, Reinforcement Learning, Bayesian Modeling, Probabilistic Programming, Variational Inference, and Unsupervised Representation Learning.

EDUCATION

Ph.D., Biomedical Engineering 2021

Research Topic: *Applied Machine Learning and AI in Cognitive Neuroscience and Healthcare*

Dissertation Title: Biology and Neuroscience Inspired Deep Learning

Advisor: Prof. [Ruogu Fang](#)

Cognition Modeling co-advised (in close collaboration) by Prof. [Mingzhou Ding](#)

University of Florida

B.S., Computer Science 2017

Performed all courses studies in pursuit of Ph.D. before moving to University of Florida with my advisor

Advisor: Prof. [Ruogu Fang](#)

Florida International University

M.S., Computer Science 2015

Research Topic: *High Performance Database System in Geospatial Data*

Advisor: Prof. [Naphtali Rishé](#)

Florida International University

B.S., Computer Information Systems 2007

Tianjin University, China

Advisor: Prof. Puling Li

EMPLOYMENTS

No matter what I do, I always try my best. I have never let anyone down yet. "Three passions, simple but overwhelmingly strong, have governed my life: the longing for love(happiness with family), the search for knowledge(explore what you like), and unbearable pity for the suffering of mankind (care about human beings).-Bertrand Russell (1872-1970)"

Postdoctoral Research Assistant (short-term transition) 1/2022 -

University of Florida, FL

Manuscript Revision for Publications (Cognition Modeling)

Advisors: Prof. Ruogu Fang & Prof. Mingzhou Ding

Research Assistant 5/2016 - 12/2021

Smart Medical Informatics Learning and Evaluation lab, University of Florida, USA, with conducting interdisciplinary research on the *applied machine learning in neuroscience and medical image analysis*.

Research Scientist 5/2019 - 8/2019

United Imaging, with *developing an intelligent and efficient 3D cardiac shape visualization and qualitative analysis system*.

Research Assistant 5/2014 - 12/2015

High Performance Database Research Center, Florida International University, USA, with the *development of high-performance computing algorithms on geospatial data*.

Software Engineer 7/2007 - 7/2013

Nantian Software, with the *development of enterprise software for computer system services*.

GRANTS

University of Florida Informatics Institute (UFII) Fellowship 1/2020 - 1/2022

Research Topic: Biology and Cognition Inspired Deep Learning, Award Amount: \$50,000.00

HONORS & AWARDS

1. **BEST UNDERGRADUATE AND GRADUATE ABSTRACT AWARD- MAIN 2021**, November 29-30, 2021, the 5th edition of the *Montreal AI and Neuroscience (MAIN)* conference. [[Award moment](#)] [[Certificate](#)]
2. **NSF Student Lightning Talk Award**, Mar 18, 2021, NSF smart and connected health PI workshop: smart health in the AI and COVID ERA.
3. **UFII Graduate Student Fellowship**, July 7, 2020. [[Department news](#)]
4. **ISBI 2018 Workshop Challenge Winner**, Yaxin Shen, Peng Liu, Ruogu Fang, Bin Sheng: “From Rough to Fine Two-stage Estimation for Optic Disc and Fovea Localization and Multiple-inputs U-Net Regression for Optic Disc Segmentation”, Indian Diabetic Retinopathy Image Dataset-IDRiD challenge workshop, in IEEE *International Symposium on Biomedical Imaging (ISBI)*, April 4-7, 2018, Washington, D.C.. *First Place Prizes* in optic disc detection [[Certificate](#)] and *First Place Prizes* in fovea detection [[Certificate](#)]. [[Department news](#)]
5. **MICCAI 2018 Workshop Challenge Top Solution**, Peng Liu, Ruogu Fang: “Regression and Learning with Pixel-wise Attention for Retinal Fundus Glaucoma Segmentation and Detection”, Retinal Fundus Glaucoma Challenge-REFUGE workshop, in *The 21st International Conference on Medical Image Computing and Computer Assisted Intervention*, September 16-20, 2018 in Granada, Spain, *Top 10 solution and oral presentation*. [[pdf](#)] [[Code](#)]
6. **Outstanding Research Assistant**, Summer 2015, High-Performance Database Research Center at Florida International University, Advisor: Prof. [Naphthali Rishe](#).

RESEARCH EXPERIENCE

1. **Computer Vision**: Object Recognition, Localization, and Tracking; Image Processing (e.g., Edge Detection); Image Denoising; Image Super-resolution; 3D Image Reconstruction; Statistical Shape Modeling

2. **Machine/Statistical Learning:** Deep Neural Network, Support Vector Machine, Linear Regression, Principle Component Analysis, Generalized Linear Model
3. **fMRI and EEG Data Analysis Methods:** Representational Similarity Analysis, Time-frequency Analysis, Granger Causality
4. **Programming Skills:** Python, MATLAB, C/C++, SQL, C Sharp, JAVA. Online Data Collection (e.g., Web Crawlers). *10+ years programming, system design, and modeling experience* as software engineer (2007 - 2013) and research assistant (2014 -). Public code can be found at [[Github](#)]

PUBLICATIONS

[[Google Scholar](#)]

Manuscripts under Review and in Preparation

1. **Peng Liu**, Mingzhou Ding & Ruogu Fang: Emergence of emotion selectivity in deep neural networks trained to recognize visual objects. (In preparation)
2. **Peng Liu**, Ke Bo, Ruogu Fang & Mingzhou Ding: A deep neural network for modeling emotion perception. (In preparation)
3. Ke Bo, **Peng Liu**, Ruogu Fang, Mingzhou Ding: Distributed amygdala neural pattern is sensitive to emotional valence: A study combining fMRI and artificial deep neural network. (In preparation)

JOURNAL

1. [**Frontiers in Radiology'22**] **Peng Liu**, Linsong Xu, Garrett Fullerton, Yao Xiao, James-Bond Nguyen, Zhongyu Li, Izabella Barreto, Catherine Olguin and Ruogu Fang: PIMA-CT: Physical Model-Aware Cyclic Simulation and Denoising for Ultralow-dose CT Restoration, in *Frontiers in Radiology* 2 (2022): 904601, *section Artificial Intelligence in Radiology*. [[In press](#)] [[Code](#)]
2. [**Neurocomputing'21**] **Peng Liu**, Charlie T. Tran, Bin Kong, Ruogu Fang: Multi-scale Collaborative Adversarial Domain Adaptation for Unsupervised Optic Disc and Cup Segmentation, in *Neurocomputing* 469 (2022): 208-220 (*Impact Factor: 6.1*). [[In press](#)] [[Code](#)]
3. [**MIA'20**] José Ignacio Orlando, **Peng Liu**, Ruogu Fang, et al: REFUGE Challenge: A Unified Framework for Evaluating Automated Methods for Glaucoma Assessment from Fundus Photographs, in *Medical Image Analysis* 59 (2020): 101570 (*Impact Factor: 8.5*).
4. [**MIA'19**] **Peng Liu**, Yangjunyi Li, Mohammad Daniel El Basha, Ruogu Fang: Deep Evolutionary Networks with Expedited Genetic Algorithm for Medical Image Denoising, in *Medical Image Analysis* 54 (2019): 306, (*Impact Factor: 8.5*). [[In press](#)] [[Code](#)]
5. [**Frontiers of Neurology'19**] Yao Xiao, **Peng Liu**, Yun Liang, Pina Sanelli, Ajay Gupta, Jana Ivanidze and Ruogu Fang: STIR-Net: Spatial-Temporal Image Restoration Net for CT Perfusion Radiation Reduction, in *Frontiers of Neurology* 10 (2019): 355, *Special Issue on Machine Learning and Decision Support in Stroke*. [[In press](#)]

CONFERENCE

1. [**MICCAI'19**] **Peng Liu**, Bin Kong, Zhongyu Li, Shaoting Zhang, Ruogu Fang: CFEA: Collaborative Feature Ensembling Adaptation for Domain Adaptation in Unsupervised Optic Disc and Cup Segmentation, in the 22nd *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, October 13-17, 2019 in Shenzhen, China (*Early Accept, Early Acceptance Rate = 15%*), Publisher: Springer, Cham, Pages: 521-529. [[pdf](#)] [[Code](#)]
2. [**MICCAI'18**] **Peng Liu**, Yangjunyi Li, Mohammad Daniel El Basha, Ruogu Fang: Neural Network Evolution Using Expedited Genetic Algorithm for Medical Image Denoising, in the 21st

International Conference on Medical Image Computing and Computer Assisted Intervention (MIC-CAI), September 16-20, 2018 in Granada, Spain (*Acceptance Rate: 373/1527 = 24.4%*), Publisher: Springer, Cham, Pages: 12-20. [[In press](#)] [[Code](#)]

3. [**ISBI'18**] **Peng Liu**, Ruogu Fang: SDCNet: Smoothed Dense-Convolution Network for Restoring Low-Dose Cerebral CT Perfusion, in *IEEE International Symposium on Biomedical Imaging (ISBI)*, April 4-7, 2018, Washington, D.C., Publisher: IEEE, Pages: 349-352. [[pdf](#)] [[Code](#)]
4. [**ACM Richard Tapia'18**] Yao Xiao*, **Peng Liu***, Yun Liang, Ruogu Fang: STDN: Spatial-Temporal Denoising Net for Radiation Optimization in CT Perfusion, in *ACM Richard Tapia Celebration of Diversity in Computing*, September 19-22, 2018 in Orlando FL, USA, Publisher: Springer, Cham, Pages: 261-275. (*Equal contribution).

ABSTRACT

1. [**MAIN'21**] **Peng Liu**, Ke Bo, Lihan Cui, Yujun Chen, Charlie Tran, Ruogu Fang & Mingzhou Ding: A deep neural network model for emotion perception, in *Montreal AI and Neuroscience*, November 29-30 virtually in Montreal, Canada. [[Abstract pdf](#)]
2. [**SfN'21**] **Peng Liu**, Ke Bo, Lihan Cui, Yujun Chen, Charlie T. Tran, Mingzhou Ding & Ruogu Fang: Emergence of emotion selectivity in deep neural networks trained to recognize visual objects, in *Society for Neuroscience*, November 8-11 virtually, and November 13-16 in Chicago, IL.
3. [**SfN'21**] **Peng Liu**, Ke Bo, Lihan Cui, Yujun Chen, Charlie Tran, Ruogu Fang & Mingzhou Ding: A deep neural network model for emotion perception, in *Society for Neuroscience*, November 8-11 virtually, and November 13-16 in Chicago, IL.
4. [**BMES,18**] **Peng Liu**, Ruogu Fang: Regulated-Convolutional Networks for Low-Dose Cerebral CT Perfusion Restoration, in *Biomedical Engineering Society Annual Meeting Annual Meeting (BMES)*, October 17-20, 2018, Georgia World Congress Center Atlanta, Georgia.
5. [**BMES'17**] **Peng Liu**, Ruogu Fang: A Simple and Realistic Simulation Method for Low-Dose CT, in *Biomedical Engineering Society Annual Meeting Annual Meeting (BMES)*, October 11-14, 2017, Phoenix, Arizona.
6. [**BMES'16**] Paul Naghshineh, **Peng Liu**, Ruogu Fang: CT Perfusion Image Super-Resolution Using a Deep Convolutional Network, in *Biomedical Engineering Society Annual Meeting (BMES)*, October 5-8, 2016 in Minneapolis, Minnesota. NSF-REU Best Poster Award, SCIS FIU. *Mentor of the first-author minority Hispanic undergraduate student.*

SELECTED INVITED TALKS

1. “Brain-Inspired AI for Human Emotion Understanding and Modeling”, Neuro-AI graduate course lecture, November 16, 2021, Virtual. [[Appreciation gift](#)]
2. “Brain-inspired AI for Understanding Emotion in the Brain”, UFII Fellows Journal Club, May 6, 2021, Virtual. [[Talk video](#)]
3. “Brain-inspired AI for Neurological and Neurodegenerative Disease Early Diagnosis”, NSF smart and connected health (SCH) PI workshop, March 2, 2021, Virtual.
4. “Modeling Neuronal Selectivity for Responding Emotion Stimuli in Human Visual System”, University of Florida, Biomedical Engineering Pruitt Research Day, November 20, 2020.

STUDENT ADVISING

I love mentoring and I did well. I got appreciations from all of them and most of them wrote me a appreciation letter.

Yangjunyi Li, M.S, BME	Fall 2018 - Fall 2019
Linsong Xu, M.S, Computer Science	Fall 2019 - Spring 2020
Mohammad D. El Basha, B.S., BME (Ph.D. student at MD Anderson)	Fall 2017 - Fall 2018
Garrett Fullerton, B.S., BME	Spring 2020
James-Bond Nguyen, B.S., BME	Spring 2020
Charlie T. Tran, B.S., Applied math (Ph.D. student at UF)	Summer 2020 - Fall 2020
Jason Chen, B.S., CS (Facebook, Inc.)	Summer 2020 - Fall 2020
Paul Naghshineh, B.S., BME	Summer 2016

PATENTS

Peng Liu, Ruogu Fang: Neural Network Evolution Using Expedited Genetic Algorithm for Medical Image Denoising, U.S. Patent No: US2221108570 Patent. [*In press*]

Peng Liu, Ruogu Fang: Systems and Methods for Reconstructing Realistic Noisy Medical Images, U.S. T18195US001 (222107-8185) PCT Patent Application published under International Publication No. WO 2022/026661.

Peng Liu, Ruogu Fang: CFEA: Collaborative Feature Ensembling Adaptation for Domain Adaptation in Unsupervised Optic Disc and Cup Segmentation, U.S. UFPT18094US001 Provisional Patent Application (In pending).

COURSEWORK

Neuroscience: Introduction to Neuroscience, Essentials of Neuroscience with MATLAB, Principles of fMRI, Neural Data Science, Neuroimaging Research Methods

Biomedical Engineering: Statistical Methods for Biomedical Engineering, Clinical Correlations, Mathematical Modeling of Biological and Physiological Systems, Biomedical Data Science, Multivariate Signal Processing, Medical Imaging, Biomedical Image Analysis

Computer Science: Algorithms, Machine Learning and AI Techniques, Computer Vision, Data Mining, Natural Language Processing, Reinforcement Learning, Data Structures and Programming Techniques, System Design and Development

Mathematics: Probability and Statistics, Advanced Statistical Methods, Multivariable Calculus, Discrete Mathematics, Bayesian Statistics: Techniques and Models